AMENDMENTS TO THE SPECIFICATION

Please replace the paragraph spanning pages 3-4 with the following amended paragraph:

An alternative approach is to place a detector structure, for example, a thin or semi-transparent ~~Schottkey~~ Schottky contact (if a ~~Schottkey~~ Schottky diode is used) or a grating (if a metal-semiconductor-metal (MSM) detector device is used) near the output of the laser so that light exiting the output of the laser (i.e. exiting through the mirror of the laser structure having the lower reflectivity relative to the other mirror) will pass by and through the detector structure as it exits the laser.

Please replace the following paragraphs from page 4 with the following amended paragraphs:

FIG. 5 illustrates, in simple fashion, a top emitting vertical cavity surface emitting laser (VCSEL) 500 using ~~Schottkey~~ Schottky contact near the output of the laser.

The laser 500 has a top mirror 502, an active region 504, and a bottom mirror 506, with the bottom mirror 506 abutting the device substrate 508. Since this VCSEL is top emitting, light output 510 is through the top mirror 502. A ~~Schottkey~~ Schottky contact 512, placed on the emission surface 514 of the laser 500, provides a current output proportional to the laser 500 output.

FIG. 6 illustrates, in simple fashion, a bottom emitting VCSEL 600 also using a ~~Schottkey~~ Schottky contact near the output of the laser.

The laser 600 has a top mirror 602, an active region 604, and a bottom mirror 606, with the bottom mirror 606 abutting the device substrate 608. Since this VCSEL is bottom emitting, light output 510 is through the substrate 608. A ~~Schottkey~~ Schottky contact 612 placed on the emission surface 614

of the laser 600 (also the surface of the substrate 608 opposite the surface on which laser mirrors 602, 606 and active region 604 reside) provides an output current proportional to the laser 600 output.

FIG. 7 illustrates, in simple fashion, a top emitting VCSEL 700 using a grating near the output of the laser.

The approach of FIG. 7 is identical to that of FIG. 5 except, instead of using a ~~Schottkey~~ Schottky contact, a grating 702 and thin or semi-transparent MSM contact 704 are used.

FIG. 8 illustrates, in simple fashion, a bottom emitting VCSEL 800 using a grating near the output of the laser.

The approach of FIG. 8 is identical to that of FIG. 6 except, instead of using a ~~Schottkey~~ Schottky contact, a grating 802 and thin or semi-transparent MSM contact 804 are used.

Please replace the paragraphs describing FIG. 5 and FIG. 6 from the "BRIEF DESCRIPTION OF THE DRAWINGS" section with the following amended paragraphs:

FIG. 5 illustrates, in simple fashion, a top emitting vertical cavity surface emitting laser (VCSEL) using ~~Schottkey~~ Schottky contact near the output of the laser;

FIG. 6 illustrates, in simple fashion, a bottom emitting VCSEL also using a ~~Schottkey~~ Schottky contact near the output of the laser;

Please replace the third of page 7 with the following amended paragraph:

FIG. 10 is an example flowchart for a control algorithm for the operation of a system having one or more opto-electronic chips according to the present invention[[.]];

Please insert the following new paragraphs between the third paragraph of page 7 (as amended) and the heading "DETAILED DESCRIPTION":

FIG. 11 is a highly simplified example of device 1100 implementing the invention;

FIG. 12 is a band diagram for a more "real world" example device similar to the device of FIG. 11;

FIG. 13 is a band diagram for the Schottkey barrier of FIG. 12 involving a one micron thick absorbing region;

FIG. 14 is a simplified example of a laser device 1400 implementing the invention;

FIG. 15 and FIG. 16 are band diagrams similar to those of FIG. 12 and FIG. 13 for an example device having a p-doped GaAs passive side mirror and configured such as shown for the device 1400 of FIG. 14;

FIG. 17 and FIG. 18 are band diagrams similar to those of FIG. 15 and FIG. 16 for an alternative example device;

FIG. 19 through FIG. 21 are highly simplified examples of top emitting laser devices implementing the invention;

FIG. 22 is a simplified illustration of a portion of a device comprising a laser array using an alternative approach with bottom emitting laser(s); and

FIG. 23 is a simplified illustration of an alternative approach implemented with a top emitting laser; and

FIG. 24 illustrates a portion of a unit, specifically a single laser from the chip of FIG. 21, after the chip has been connected to an electronic chip.

Please replace the first full paragraph on page 9 with the following amended paragraph:

A thin layer of material 1120 that will typically be less than two microns thick, for example, one micron thick layer, is placed on the passive side mirror 1110. A ~~Schottkey~~ Schottky metal contact 1122 is formed on top of the material 1120 and is used for detection of a current produced in the material by the leaked photons. It should be noted that, while the design of many laser structures automatically result in some slight photon leakage out of the passive side mirror, if the particular design does not have sufficient leakage, a slight altering of the reflectivity of the passive side mirror can be made to increase the leakage without meaningfully affecting the laser's operation.

Please replace the paragraph spanning pages 10-11 with the following amended paragraph:

In order to effectively do so, the proper material must be selected so that a ~~Schottkey~~ Schottky contact, as opposed to an to an ohmic contact is formed. Since the process for formation of a ~~Schottkey~~ Schottky contact *per se* is known, a detailed discussion is unnecessary here. However, for completeness, a brief side discussion of pertinent details related to formation of an example ~~Schottkey~~ Schottky contact for use, for example, with a device as described herein in connection with FIG. 11 is set forth below with the understanding that other ~~Schottkey~~ Schottky contacts using other materials, for example, Titanium (Ti), Gold (Au), Nickel (Ni) and Platinum (Pt) to name a only a representative few.

Please replace the third and fourth full paragraphs on page 11 with the following amended paragraphs:

FIG. 13 is a band diagram for the ~~Schottkey~~ Schottky barrier of FIG. 12 involving a one micron thick absorbing region.

This configuration operates as follows. When the laser is operating, the bulk of the photons exit the emission side of the laser. However, a small percentage of the generated photons leak out the passive side and they do so in statistical proportion to the laser emission output. Those "leaked" photons enter the absorbing region where the light power is converted to electrical power. The electrical power is then measured by the ~~Schottkey~~ Schottky detector via the ~~Schottkey~~ Schottky contact and, based upon the measurement, appropriate adjustments or a determination of whether the laser is effectively or actually dead can be made.

Please replace the first paragraph on page 12 with the following amended paragraph:

The configuration of FIG. 11 is, however, not suitable for some applications. This is because, for operation of the configuration of FIG. 11, in order to bias the laser for lasing, the p-contact must be biased positively with respect to the n-contact. However, for the Schottky detector, the Schottky contact must be: a) biased positively with respect to the ~~Schottkey~~ Schottky detector's other contact when that other contact is connected to a p-type layer; or b) biased negatively with respect to the Schottkey detector's other contact when the other contact is connected to an n-type layer. In addition, it is desirable to keep the overall voltage levels as low as possible. Thus, in an ideal situation, one would use all the voltage for the laser. However, biasing the ~~Schottkey~~ Schottky detector contact requires some voltage and therein detracts from the laser voltage which, in some cases, could limit the operation of the laser.

Please replace the first full paragraph on page 13 with the following amended paragraph:

FIG. 14 is a simplified example of a laser device 1400 implementing the invention in such a situation as described immediately above. As shown in FIG. 14, an n-type region 1402 is grown at the top of the upper p-type region that comprises the top mirror 1404. Depending upon the particular implementation, the n-type region 1402 can be in addition to the top mirror 1404 or can comprise the top of the mirror itself (not shown). An absorbing region 1408 and a ~~Schottkey~~ Schottky contact 1410 are respectively layered on top of the n-type region 1402. Moreover, the n-type region 1402 can be left floating (i.e. it has no applied voltage) or can be shorted to the p-type mirror 1404. As shown in FIG. 14, the two are connected (i.e. in the shorted configuration) by the upper contact 1406.

Please replace the paragraph spanning pages 14-15 with the following amended paragraph:

FIG. 19 is a simplified example of a device 1900 incorporating the invention. As with the devices using bottom emitting lasers, the device of FIG. 19 includes a laser 1902 made up of a substrate 1904, a bottom (i.e. passive side) mirror 1906, a top (i.e. emission side) mirror 1908, and an active region 1910 between the bottom mirror 1906 and top mirror 1908. The substrate 1904 is a material that absorbs the wavelength(s) that the laser emits. As shown, the substrate 1904 is also a semi insulating material. As a result, photon leakage into the substrate 1904 generates photocarriers. If the substrate 1904 is not too thick (i.e. it is sufficiently thin to allow for collection of the photocarriers) it can be used as the absorbing (i.e. Schottky diode) material as described above. As a result, a Schottky contact ~~1910~~ 1914 can be placed on the back side 1912 of the substrate 1904. The arrangement thereafter operates in

the same manner as the bottom active implementation, i.e. photon leakage generates a current roughly proportional to the output that is picked up by the ~~Schottkey~~ Schottky contact ~~1910~~ 1914.

Please replace the paragraph spanning pages 15-16 with the following amended paragraph:

FIG. 20 is a simplified example of a device 2000 incorporating the invention, virtually identical to the device 1900 for FIG. 19, but in the case where the substrate 2002 was originally too thick to be used as the absorbing region. As shown, the substrate 2002 has been reduced in a specified area by patterning and etching using an isotropic etching process so as to form an inwardly facing opening. The ~~Schottkey~~ Schottky contact 2004 is then formed or placed inside the opening using, for example, a sputter deposition or other suitable process.

Please replace the second full paragraph on page 16 with the following amended paragraph:

FIG. 21 is a simplified example of a device 2100 incorporating the invention wherein the substrate 2102 is a doped substrate. To implement the invention, a semi-insulating layer 2104 is grown either under or as part of the passive side mirror 2106. The semi-insulating layer 2104 will act as the absorbing region for the device. An opening 2108 is then made in the substrate 2102 from the rear side 2110 of the substrate 2102 so as to expose a suitable area of the semi-insulating layer 2104 to access from the rear side 2110. The ~~Schottkey~~ Schottky contact 2112 is then formed as noted above and connects with the absorbing region 2104 through the substrate 2104 via the opening 2108.

Please replace the first, second and third full paragraphs on page 19 with the following amended paragraphs:

When a hybridization approach is used, the ~~Schottkey~~ Schottky contact can, in some implemetations, originate as part of the electronic integrated circuit (IC) as opposed to being part of the optical IC (i.e. the chip the lasers are part of). This alternative approach is illustrated in FIG. 22 and FIG. 23.

FIG. 22 is a simplified illustration of a portion 2202 of a device 2200 (not shown) comprising a laser array using this alternative approach with bottom emitting laser(s). The laser 2204 shown is configured as described above in connection with FIG. 11 except, while the absorbing region 2206 is part of the laser-bearing chip 2208, it has no ~~Schottkey~~ Schottky contact. A dielectric 2210 coats the laser(s) 2204 and is used to "planarize" the rest of the laser-bearing chip 2208 with the outwardmost surface 2212 of the absorbing region 2206. The device contacts 2214 are brought out through the dielectric 2210 to the level surface 2212, for example by etching through the dielectric 2210 to the contacts 2214 and filling the hole with a metal or other electrically conductive material 2215.

A electronic chip 2216, to which the laser-bearing chip 2208 is hybridized, comprises a set of electrical contacts 2218 that correctly electrically correspond with the device contacts 2214 and a ~~Schottkey~~ Schottky contact 2220 placed so that when the chips 2208, 2216 are hybridized together it properly connects to the absorbing region 2206.

Please replace the paragraph spanning pages 19-20 with the following amended paragraph:

FIG. 23 is a simplified illustration of this alternative approach implemented with a top emitting laser. This approach similar to the approach discussed with respect to FIG. 22 except for the use of top emitting laser(s) 2302. As with FIG. 22, in the implementaion of FIG. 23, the ~~Schottkey~~ Schottky contact 2304 is part of the electronic chip 2306 to which the laser-bearing chip 2308 will be hybridized and the device contacts 2310 are brought into contact with the electronic chip 2306 through the substrate 2312, for example, by etching an opening 2314 in the substrate 2312 and making the opening 2314 electrically conductive using a deposition or other filling process or passing a wirebond 2316 through the opening 2314. Of course, an optional planarizing dielectric 2318 can also be used.

Please replace the second full paragraph on page 20 with the following amended paragraph:

Once the optical device bearing chip(s) connect to the electronic chip(s) (whether by hybridization, wire bonding, or other approach) the connected devices can be used, for example, in a network or communication system as follows. For simplicity, hereafter, we refer to the laser devices and electronic chip(s) combination as an "opto-electronic unit". The opto-electronic unit is set up to, for example, periodically or continually monitor the output from the detector (comprising the passive side absorbing region and ~~Schottkey~~ Schottky contact) and compute new I_{bias} and I_{mod} settings as necessary based upon that output.